ANNUAL REPORT FOR 2000

Huskanaw Swamp Mitigation Site

Martin County

Project No. 6.099008T

TIP No. R-2111 WM

Prepared By:
Natural Systems Unit & Roadside Environmental Unit
North Carolina Department of Transportation
December 2000

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SUMMARY

The following report summarizes the monitoring activities at the Huskanaw Swamp Mitigation Site. This site was constructed in 1996 to provide wetland mitigation for the relocation of US 64. The site is monitored with three monitoring gauges and three vegetation plots. The year 2000 reflects the third complete year that monitoring has taken place on the site.

One of the three monitoring gauges showed saturation for more than 21.5% of the growing season while the remaining two indicated saturation for 11.5% and 9.4% of the season. This is the third year in a row in which all groundwater gauges located on the site have met the minimal hydrologic success criteria.

Though all of the gauges are not meeting the 12.5% threshold, each gauge on the site has consistently met the minimal criteria of 8% - 12.5%. This range of success falls within the "transitional areas" as defined in the mitigation plan, dated October 1994.

Vegetation monitoring yielded an average plot density of 574 trees per acre, with each of the eight plots showing successful stem counts. This is the third year in a row in which average plot density has exceeded the minimal criteria for success.

The daily rainfall data depicted on the monitoring gauge graphs is recorded from an on-site rain gauge that was installed on May 23, 2000. Additional rainfall data used for the 30-70 was recorded at the Williamston rain gauge, maintained by the NC State Climate Office.

Based on the hydrologic and vegetation success observed over the past three years, the NCDOT feels that this site has met its design objective to restore both wet hardwood forest and swamp forest wetland communities.

Therefore the NCDOT requests a review of this site and a consultation with COE personnel to determine the jurisdictional extent of the transitional areas. The overall success for this site will remain unresolved until a determination is made. At which time, if the COE concurs with the above conclusions, then the NCDOT recommends that all monitoring activities be discontinued at this site.

1.0 Introduction

1.1 Project Description

The Huskanaw Swamp Mitigation Site is located in north central Martin County and encompasses approximately 112 acres. It is approximately 0.95 miles west of the US 64 - US 64 Business Interchange, along SR 1405 (Figure 1). The site was originally constructed in the winter of 1996-97. However, planting activities were not completed until February 1998. Since construction activities were not completed before the start of the 1997 growing season, the site has just now completed its third year of monitoring.

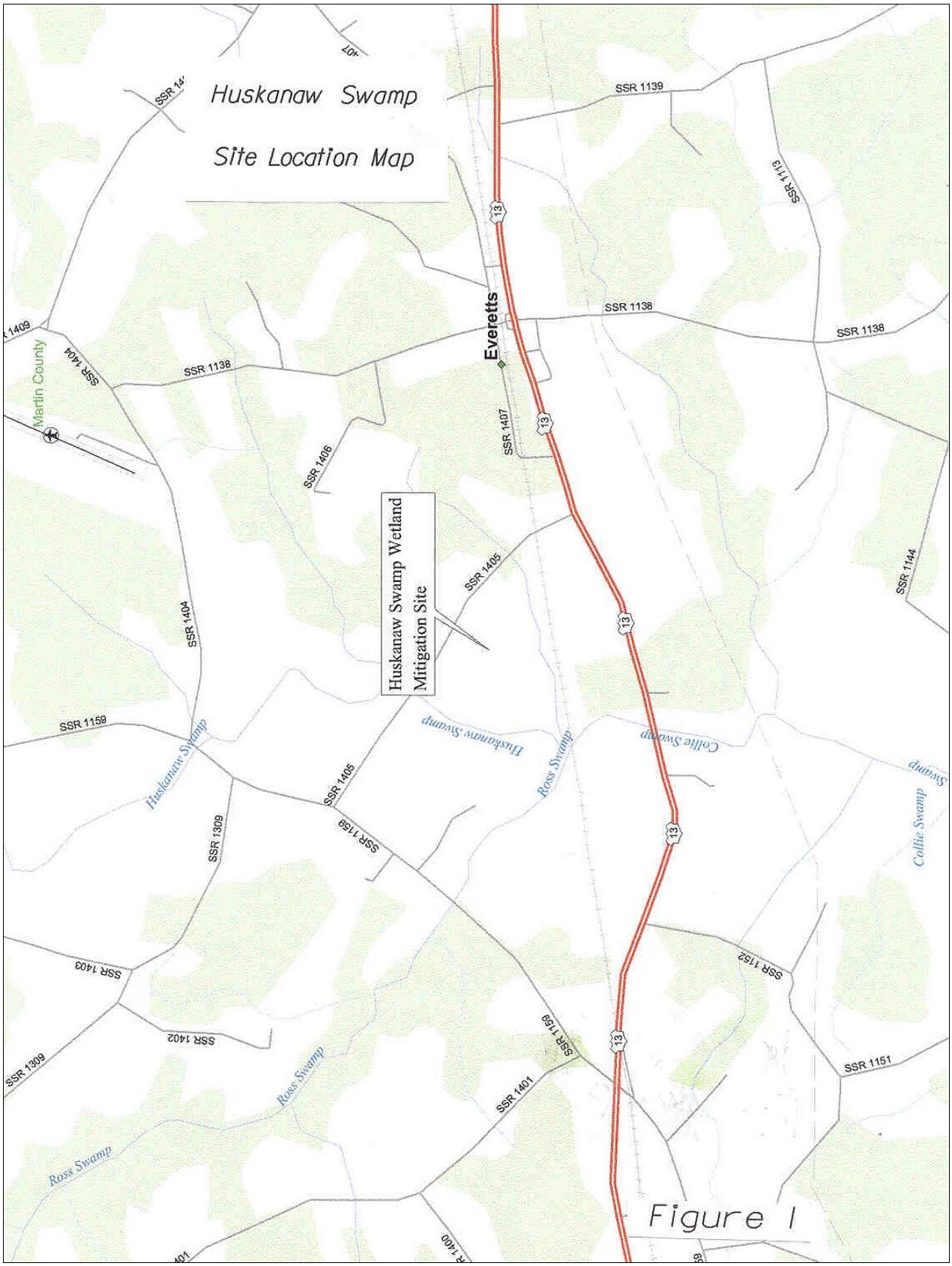
The site serves as mitigation for the US 64 relocation and consists of restoration, enhancement, and preservation. The site is designed to restore both wet hardwood forest and swamp forest wetland communities. An additional area preserves approximately 33 acres of swamp/ bottomland forest wetlands.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of three years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetation monitoring during the 2000 growing season at the Huskanaw Swamp Mitigation Site. Included in this report are analyses of both hydrologic and vegetative monitoring results as well as local climate conditions throughout the growing season.

1.3 Project History

Winter 1996-97	Site Constructed
April 1997	Monitoring Gauges Installed
April- November 1997	Hydrologic Monitoring
February 1998	Site Planted
March- November 1998	Hydrologic Monitoring (1 yr.)
October 1998	Vegetation Monitoring (1 yr.)
March- November 1999	Hydrologic Monitoring (2 yr.)
October 1999	Vegetation Monitoring (2 yr.)
March- November 2000	Hydrologic Monitoring (3 yr.)
September 2000	Vegetation Monitoring (3 yr.)


Huskanaw Swamp
Site Location Map
Huskanaw Swamp Wetland
Mitigation Site
Everetts
Martin County
SSR 1139
SSR 1138
SSR 1407
SSR 1406
SSR 1405
SSR 1404
SSR 1159
SSR 1309
SSR 1403
SSR 1402
SSR 1401
SSR 1400
SSR 1158
SSR 1152
SSR 1151
SSR 1144
SSR 1113
Ross Swamp
Collie Swamp
Figure 1

2.0 Hydrology

2.1 Success Criteria

In accordance with federal guidelines for wetland mitigation and the wetland mitigation plan (entitled "North Carolina Department of Transportation (NCDOT) US 64 Wetland Restoration and Conservation Management Plan, Edgecombe and Martin Counties", dated October 1994) the success criteria for hydrology states that the area must be inundated or saturated (within 12" of the surface) by surface or ground water for at least a consecutive 12.5% of the growing season. This success criteria was agreed upon as part of the special conditions set forth by the Corps of Engineers (COE) through their issuance of permits for NCDOT's TIP projects R-2112 and R-218A (Action ID Nos. 199400663 and 199501132). Also included in the success criteria, is the following: areas inundated less than 5% of the growing season are always classified as non-wetlands, while zones inundated between 5% - 12.5% of the growing season can be classified as wetlands based on factors such as the presence of hydrophytic vegetation and hydric soils. Consultation with COE personnel will be undertaken to determine jurisdictional extent of these transitional areas.

The growing season in Martin County begins March 16 and ends November 14. The dates correspond to a 50% probability that temperatures will drop to 28^{o} F or lower after March 16 and before November 14.[1] The growing season is 244 days; therefore, the optimum duration for wetland hydrology is 30 consecutive days.

2.2 Hydrologic Description

Three monitoring gauges were installed on site in April of 1997 (Figure 2). Rainfall is the primary hydrologic input for the Huskanaw site. The automatic monitoring gauges record daily readings of the groundwater depth. The 2000 data represents the third full growing season for hydrologic monitoring.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 244 day growing season (May 16 – August 31). It is this hydrologic data which will determine the success of this mitigation site.

[1] Soil Conservation Service, Soil Survey of Martin County, North Carolina, p.75.

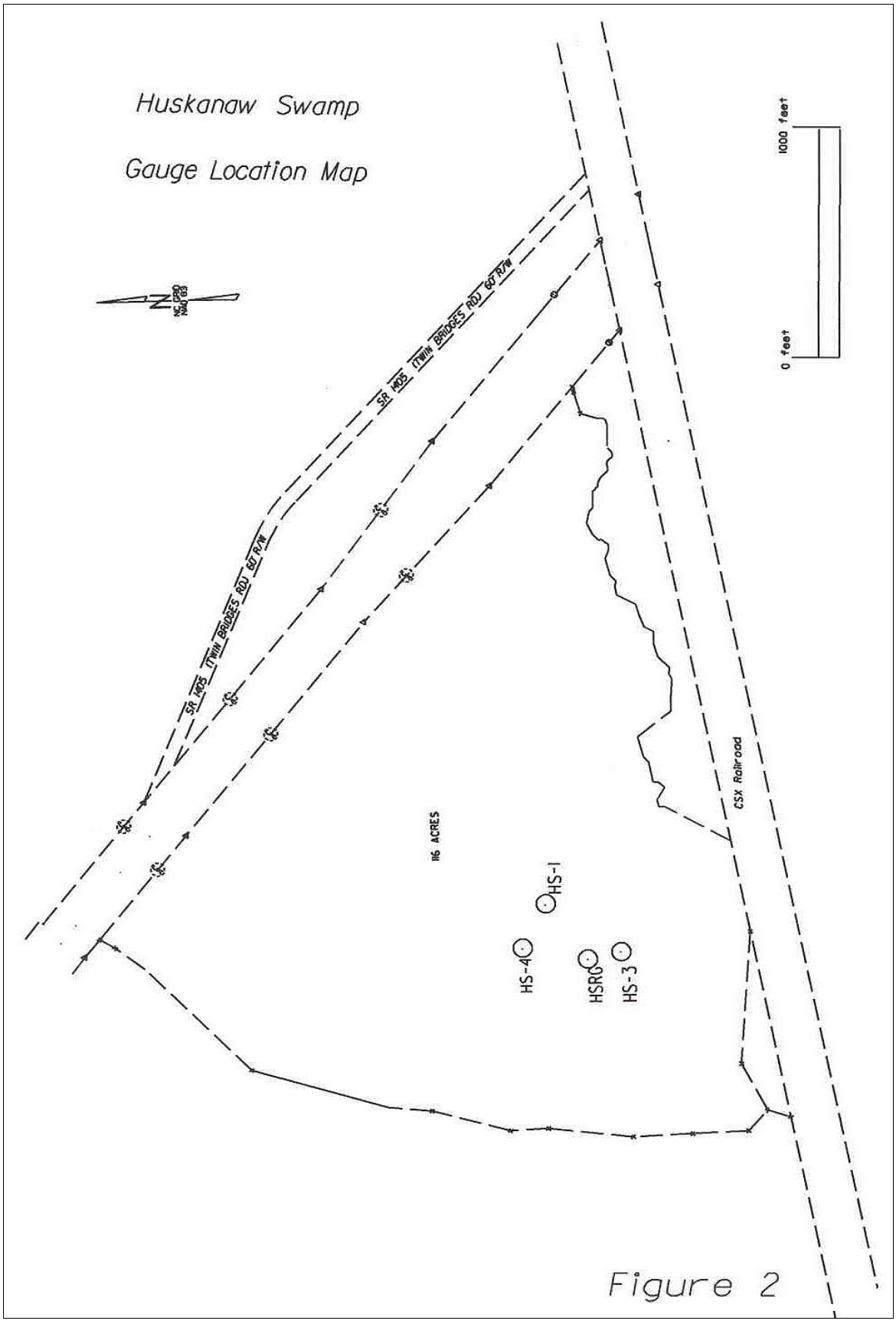

Huskanaw Swamp
Gauge Location Map
NC 603
NAD 83
SR 1405 (TWIN BRIDGES RD) 60' R/W
SR 1405 (TWIN BRIDGES RD) 60' R/W
1000 feet
0 feet
116 ACRES
HS-1
HS-4
HSR6
HS-3
CSX Railroad

Figure 2

There were no problems with the monitoring gauge units during the growing season. Table 1 shows the hydrologic results for 2000.

Table 1. Hydrologic Monitoring RESULTS - 2000

Monitoring Gauge	< 5%	5% - 8%	8% - 12.5%	> 12.5%	Actual %	Success Dates
HS-1				✔	21.7	Mar 16 – May 7
HS-3			✔		11.5	Apr 14 – Apr 6
HS-4			✔		9.4	Apr 9 – May 6

(Figure 3 is a graphical representation of the hydrologic monitoring results)

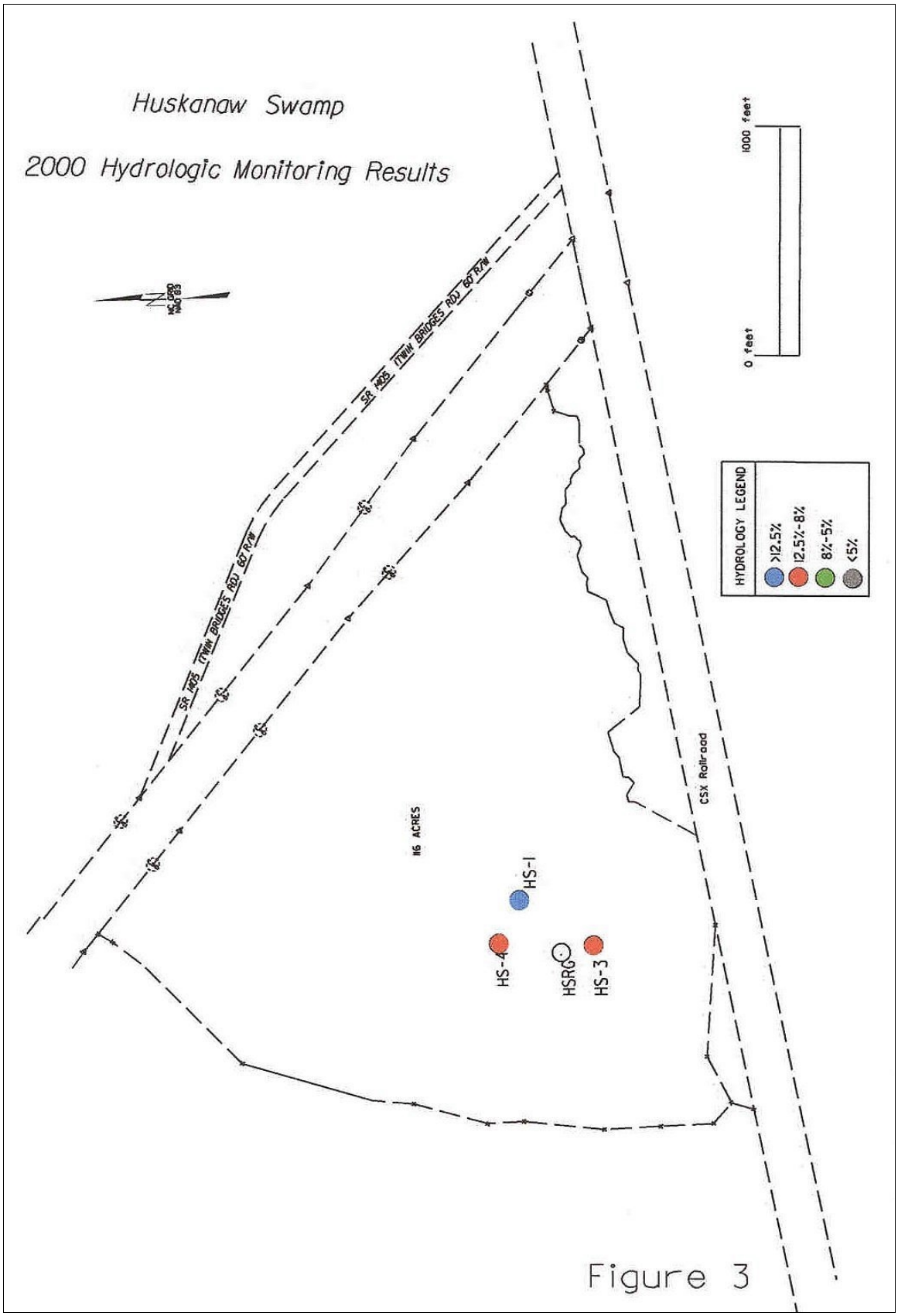
Appendix A contains charts of the groundwater depth for each monitoring gauge during 2000. These monitoring gauge graphs are designed to show the reaction of the groundwater level to specific rainfall events. The maximum number of consecutive days are noted on each graph.

Daily precipitation events, shown on each monitoring gauge graph, represent data collected from the Williamston weather station as well as data from the onsite rain gauge. A new rain gauge was to be installed prior to the beginning of the 2000 growing season, thus eliminating the need for weather station data on the monitoring gauge graphs. However, the rain gauge was not actually installed until late May. While the rainfall amounts recorded from the weather station may not be exactly equal to what was received on the site, they are a local representative and can be used for a tentative comparison.

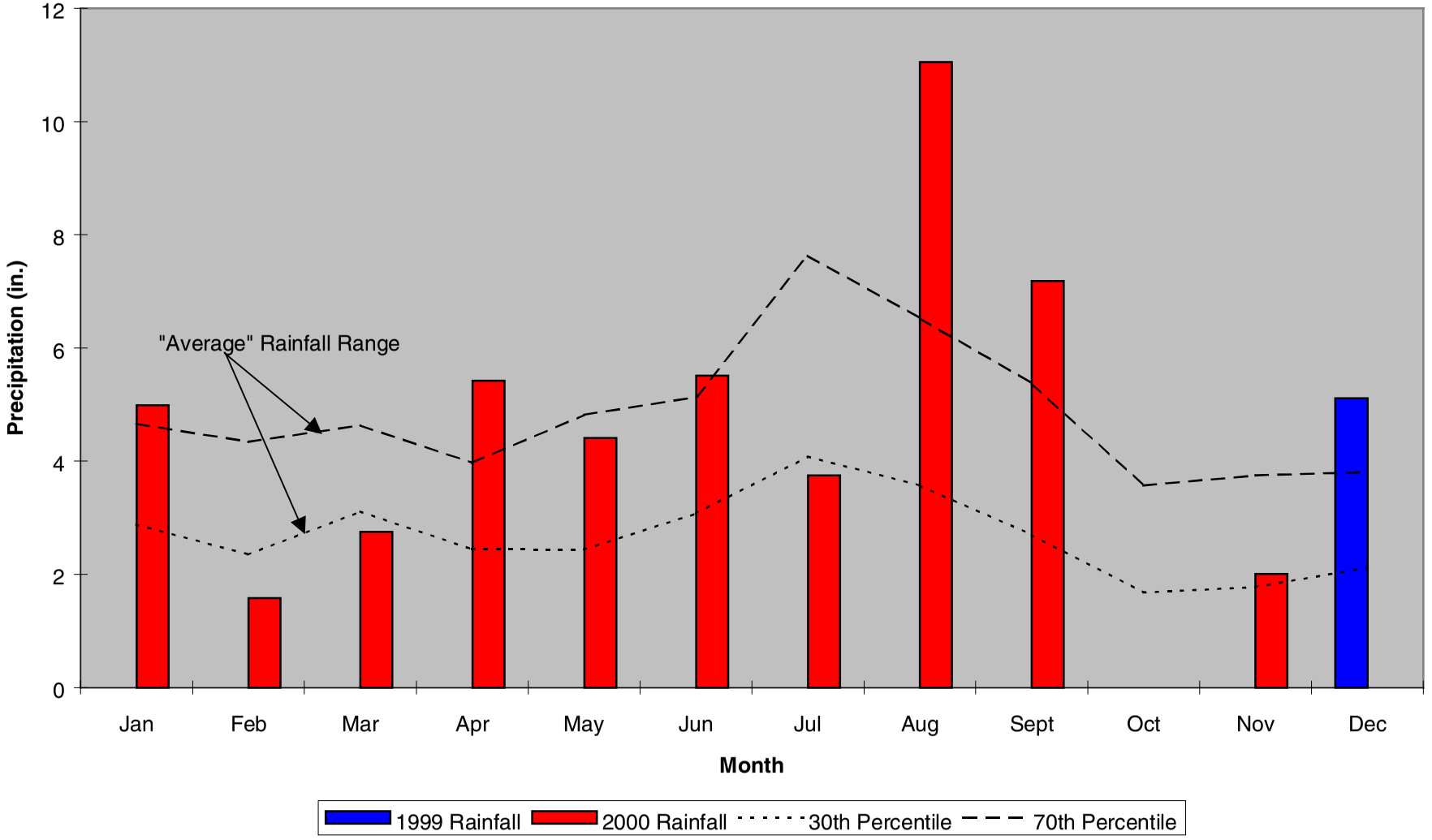
2.3.2 Climatic Data

Figure 4 is a comparison of monthly rainfall from winter the of 1999 and the entire growing season of 2000 to historical precipitation (collected between 1931 and 1999) for Williamston, North Carolina. This comparison gives an indication of how 2000 relates to historical data in terms of climate conditions. All off-site data was provided by the NC State Climate Office. Because data for the complete 2000 year was not available at the time this report was published, the rainfall totals for December 2000 are not included. Data for December 1999 is included in Figure 4, as was promised in the 1999 Annual Report.

Monthly rainfall for the Williamston area fluctuated around the average rainfall for this site. February, March, and July saw below average rainfall. The months of January, April, May, June, August, and September all recorded average or above average rainfall for the site. October was an extremely dry month with no recorded rainfall.


Huskanaw Swamp
2000 Hydrologic Monitoring Results
NC GRID NAD 83
SR 1405 (TWIN BRIDGES RD) 60' R/W
SR 1405 (TWIN BRIDGES RD) 60' R/W
1000 feet
0 feet
HYDROLOGY LEGEND
>12.5%
12.5%-8%
8%-5%
<5%
116 ACRES
CSX Railroad
HS-1
HS-4
HSRG
HS-3
Figure 3

Huskanaw Swamp 30-70 Percentile Graph
Williamston, NC



2.4 Conclusions

All of the monitoring gauges recorded saturation within one foot of the surface for at least 9.4% of the growing season, with one gauge HS-1 showing saturation for 21.7% of the season and the other two gauges, HS-3 and HS-4, showing saturation for 11.5% and 9.4% of the growing season. These results are similar to the 1999 results, in which HS-1 recorded saturation for 13.1% of the growing season while the remaining two gauges recorded saturation for at least 9.4% of the season.

Though all of the gauges are not meeting the 12.5% threshold, each gauge on the site has consistently met the minimal criteria of 8% - 12.5%. This range of success falls within the "transitional areas" as defined in the mitigation plan, dated October 1994. Based on the criteria and the 2000 hydrologic results, consultation with COE personnel is desired to determine the jurisdictional extent of these transitional areas and the overall success for this site.

3.0 VEGETATION

3.1 Success Criteria

In accordance with federal guidelines for wetland mitigation and the wetland mitigation plan, dated October 1994, which was agreed upon as part of the special conditions of the associated permits, the success criteria for vegetation states that there must be a minimum of 320 trees per acre living for at least three consecutive years.

3.2 Description of Species

The following planting communities were planted on the site:

Zone 1: Wet Hardwood Forest (56.6 acres)

Fraxinus pennsylvanica, green ash
Quercus laurifolia, laurel oak
Quercus falcata var. *pagodaefolia*, cherrybark oak
Quercus michauxii, swamp chestnut oak
Quercus phellos, willow oak
Quercus falcata, southern red oak
Quercus nigra, water oak
Nyssa aquatica, water tupelo

Zone 2: Oak/Hickory Forest (19.2 acres)

Quercus alba, white oak
Quercus nigra, water oak
Quercus falcata, southern red oak
Carya tomentosa, mockernut hickory
Carya glabra, pignut hickory
Quercus palustris, post oak
Quercus falcata var. *pagodaefolia*, cherrybark oak
Quercus phellos, willow oak
Quercus michauxii, swamp chestnut oak

Zone 3: Long Leaf-Oak/Hickory Forest (11.1 acres)

Pinus palustris, longleaf pine
Quercus marilandica, blackjack oak
Quercus phellos, willow oak
Quercus stellata, post oak
Carya tomentosa, mockernut hickory
Carya glabra, pignut hickory
Quercus michauxii, swamp chestnut oak
Quercus alba and *nigra*, white and water oak
Quercus falcata, southern red oak

3.3 Results of Vegetation Monitoring

(See Appendix B for Site Photos and a Photo and Plot Locations Map)

ZONE	Plot #	Green Ash	Cherrybark Oak	Swp Chestnut Oak	Willow Oak	Water Oak	Post Oak	Mockernut Hickory	Bitternut Hickory	Southern Red Oak	Water Tupelo	Blackjack Oak	Longleaf Pine	Laurel Oak	Total	Total (at planting)	Density (Tree/Acre)
1	1	3	3	1	4						4			3	18	18	680
	3	1	1	5		1					3				11	21	356
	5	2	1								6				9	18	340
	6	7	14	9	6									1	37	42	599
	8	18	6	6	3					2				7	42	42	680
								ZONE 1 AVERAGE DENSITY									531
2	4		6	5	6			8	3	1					29	34	580
	7		3				4	7	15	11					40	40	680
								ZONE 2 AVERAGE DENSITY									630
3	2		2		12		1	2	3	4		10	2		36	36	680
								ZONE 3 AVERAGE DENSITY									680
								TOTAL AVERAGE DENSITY									574

Site Notes:

Zone 1: Additional species observed include broomsedge (*Andropogon virginicus*), tulip poplar (*Liodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), bald cypress (*Taxodium distichum*), cottonwood (*Populus deltoides*), river birch (*Betula nigra*), blackgum (*Nyssa sylvatica*), tall cane (*Arundinaria gigantea*), pines (*Pinus* sp.), trumpet creeper (*Campsis radicans*), and sicklepod (*Cassia obtusifolia*). Standing water was observed in plots 3 and 5. Evidence of deer grazing was observed in plot 8. Zone 2: Additional species observed include broomsedge, sicklepod, bermuda grass (*Cynodon dactylon*), ragweed (*Ambrosia artemisiifolia*), and red maple. Zone 3: Growth and success of desired species looks great!

Consensus of Observations: Broomsedge is present throughout the site. Red maple and sweetgum are prevalent throughout cut over areas.

3.4 Conclusions

Vegetation monitoring yielded an average plot density of 574 trees per acre, with eight of eight plots showing successful stem counts. This is the third year in a row in which average plot density has exceeded the minimal criteria for success.

A total of 87 acres was planted on this site. The vegetation monitoring of the planted areas revealed an average density of 531 trees per acre for Zone 1, 630 trees per acre for Zone 2, and 680 trees per acre for Zone 3. All zones exceed the minimum requirement of 320 trees per acre.

It was noted in last year's comments from the agencies that red maple and sweetgum were invading the site and could affect the desired species. Based on the 2000 plot data, the invasion of red maple and sweetgum has not affected the success criteria of the planted trees.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

- One of the three monitoring gauges showed saturation for more than 21.5% of the growing season while the remaining two indicated saturation for 11.5% and 9.4% of the season. This is the third year in a row in which all groundwater gauges located on the site have met the minimal hydrologic success criteria, as stated in the associated permit's conditions.

- Vegetation monitoring yielded an average plot density of 574 trees per acre, with eight of eight plots showing successful stem counts. This is the third year in a row in which average plot density has exceeded the minimal criteria for success, as stated in the associated permit's conditions.

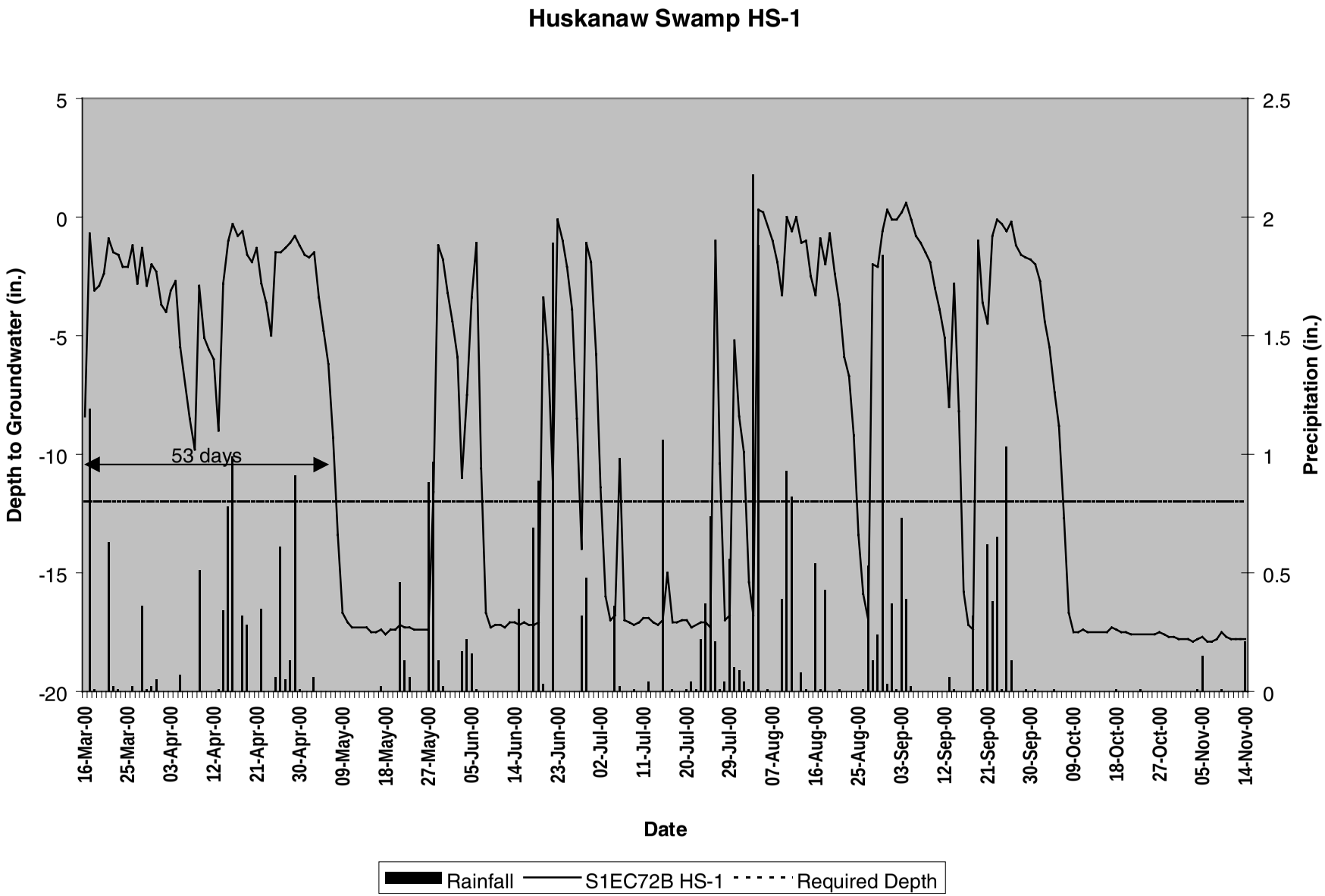
- Based on the hydrologic and vegetation success observed over the past three years, the NCDOT feels that the Huskanaw Mitigation Site has met its design objective to restore both wet hardwood forest and swamps forest wetland communities.

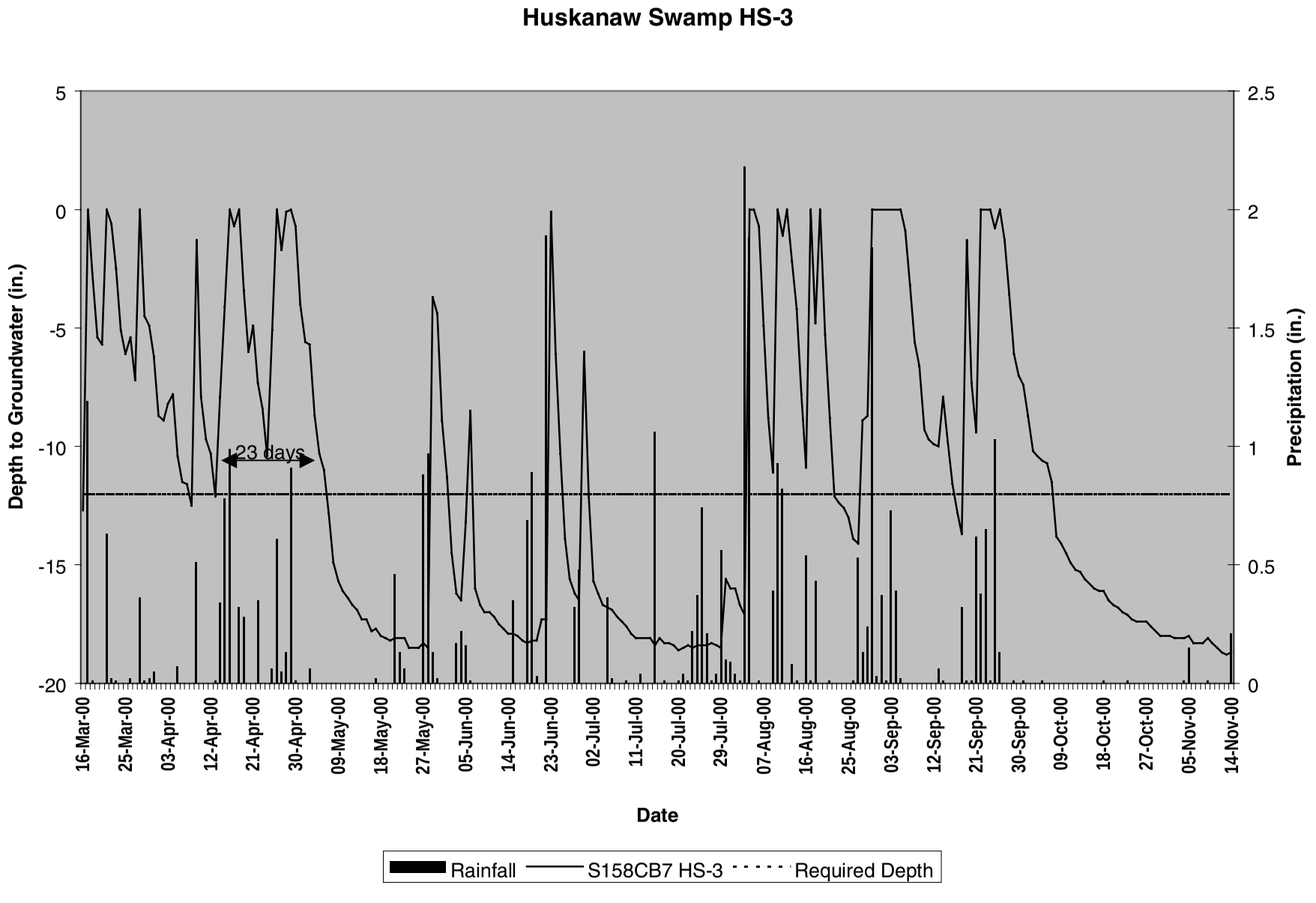
<u>Recommendations</u>

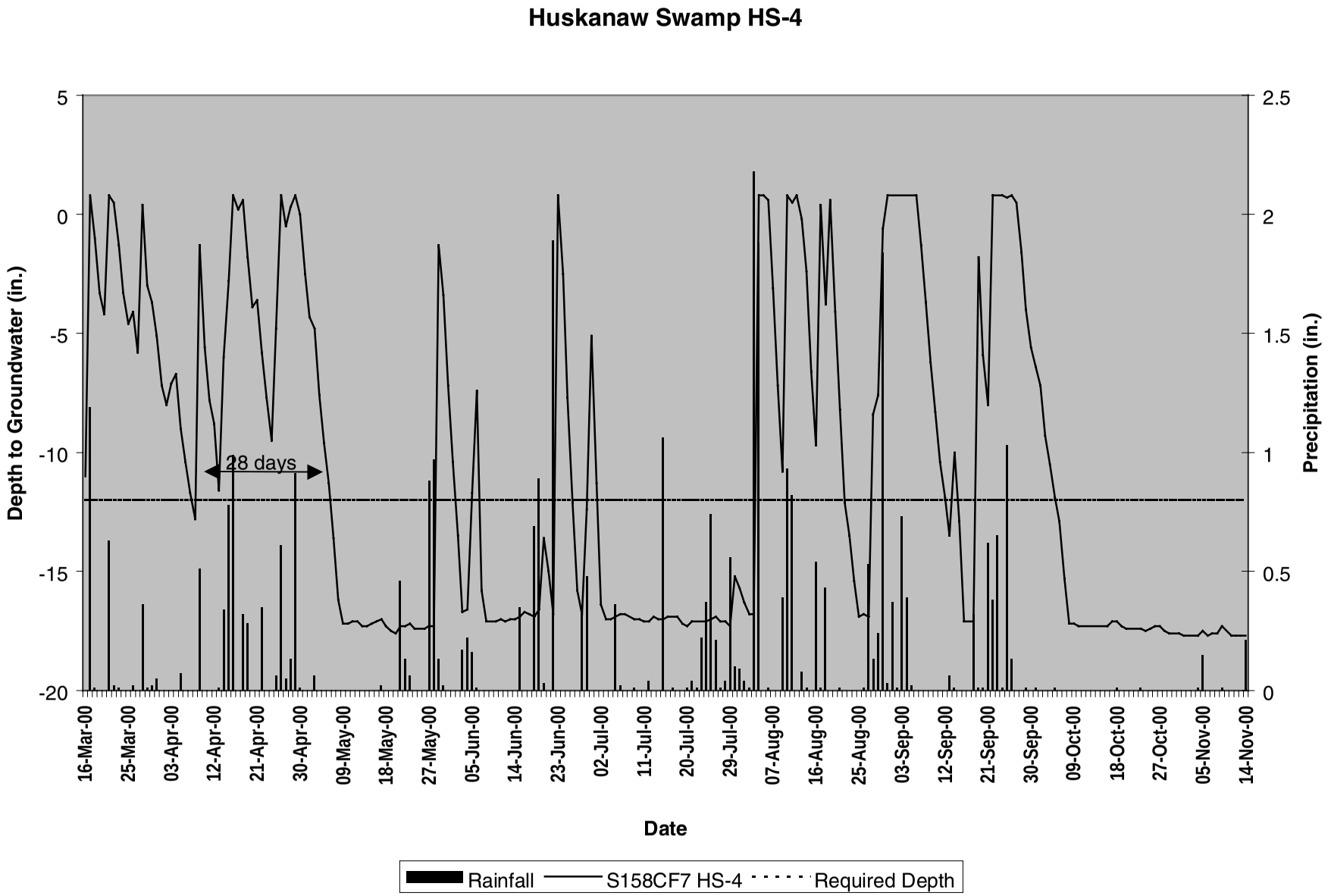
- The NCDOT requests a review of this site and a consultation with COE personnel to determine the jurisdictional extent of the transitional areas. The overall success for this site will remain unresolved until a determination is made. At which time, if the COE concurs with the above conclusions, then the NCDOT recommends that all monitoring activities be discontinued at this site.

APPENDIX A

DEPTH TO GROUNDWATER CHARTS


Huskanaw Swamp HS-1
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
2.5
2
1.5
1
0.5
0
53 days
16-Mar-00
25-Mar-00
03-Apr-00
12-Apr-00
21-Apr-00
30-Apr-00
09-May-00
18-May-00
27-May-00
05-Jun-00
14-Jun-00
23-Jun-00
02-Jul-00
11-Jul-00
20-Jul-00
29-Jul-00
07-Aug-00
16-Aug-00
25-Aug-00
03-Sep-00
12-Sep-00
21-Sep-00
30-Sep-00
09-Oct-00
18-Oct-00
27-Oct-00
05-Nov-00
14-Nov-00
Date
Rainfall
S1EC72B HS-1
Required Depth


Huskanaw Swamp HS-3
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
2.5
2
1.5
1
0.5
0
23 days
16-Mar-00
25-Mar-00
03-Apr-00
12-Apr-00
21-Apr-00
30-Apr-00
09-May-00
18-May-00
27-May-00
05-Jun-00
14-Jun-00
23-Jun-00
02-Jul-00
11-Jul-00
20-Jul-00
29-Jul-00
07-Aug-00
16-Aug-00
25-Aug-00
03-Sep-00
12-Sep-00
21-Sep-00
30-Sep-00
09-Oct-00
18-Oct-00
27-Oct-00
05-Nov-00
14-Nov-00
Date
Rainfall
S158CB7 HS-3
Required Depth


Huskanaw Swamp HS-4
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
2.5
2
1.5
1
0.5
0
28 days
16-Mar-00
25-Mar-00
03-Apr-00
12-Apr-00
21-Apr-00
30-Apr-00
09-May-00
18-May-00
27-May-00
05-Jun-00
14-Jun-00
23-Jun-00
02-Jul-00
11-Jul-00
20-Jul-00
29-Jul-00
07-Aug-00
16-Aug-00
25-Aug-00
03-Sep-00
12-Sep-00
21-Sep-00
30-Sep-00
09-Oct-00
18-Oct-00
27-Oct-00
05-Nov-00
14-Nov-00
Date
Rainfall
S158CF7 HS-4
Required Depth

APPENDIX B

SITE PHOTOS
AND
PHOTO AND PLOT LOCATIONS MAP

Huskanaw Swamp

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Huskanaw Swamp

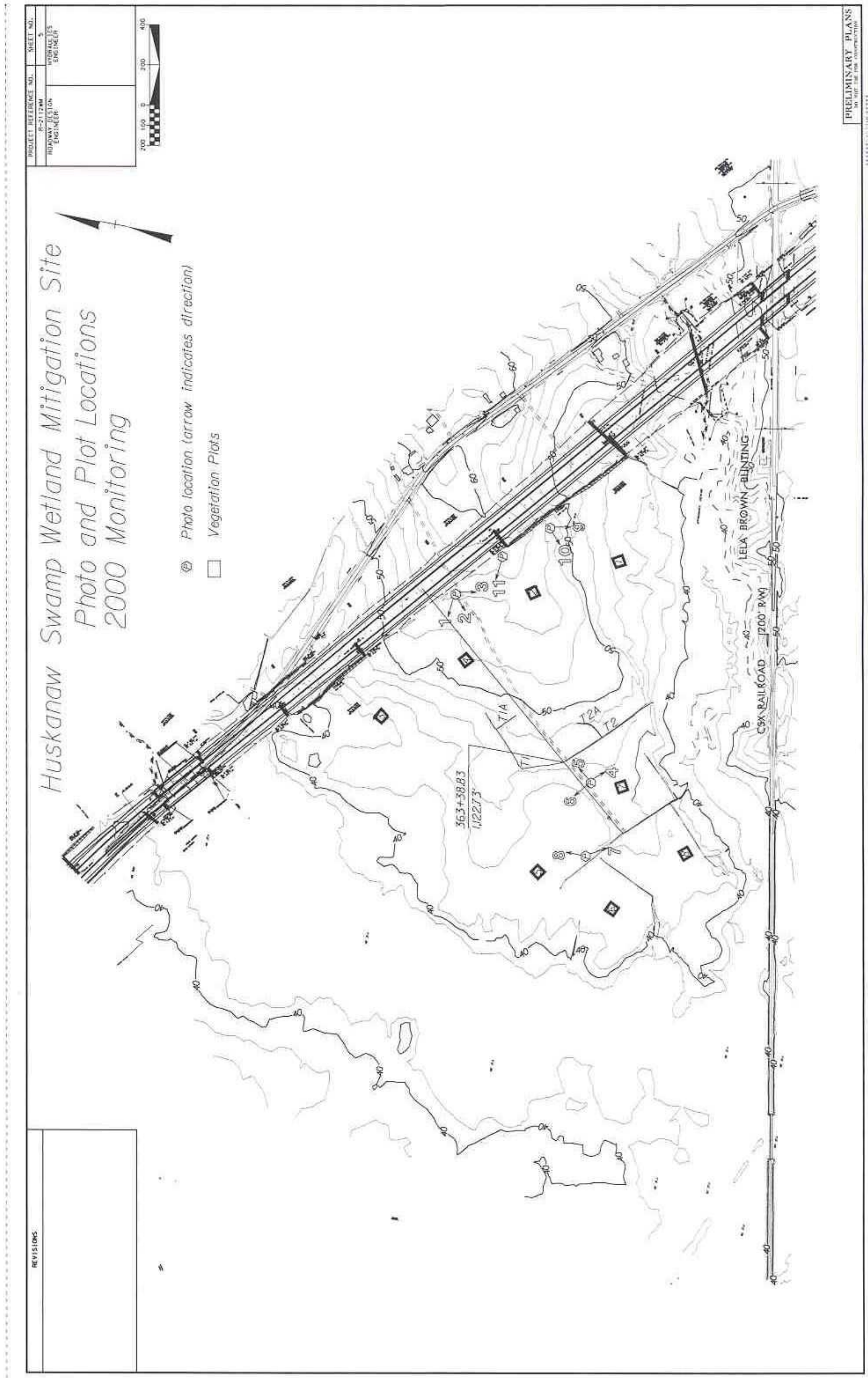
Photo 7

Photo 8

Photo 9

Photo 10

Figure 5


Huskanaw Swamp Wetland Mitigation Site
Photo and Plot Locations
2000 Monitoring
Photo location (arrow indicates direction)
Vegetation Plots
LELA BROWN BUNTING
CSX RAILROAD
200' R/W
363+38.83
PRELIMINARY PLANS
REVISIONS